

WHAT I CLAIM IS:

1. A vehicle for travel through a conduit comprising:

a forward and a rearward member, each member being provided with a wall-engaging mechanism for selectively engaging a wall of the conduit to hold the respective member in a stationary position within the conduit, each wall-engaging mechanism including a plurality of legs extendable outwardly from the respective member and a wall-engaging surface on or fixed to each leg;

extensible means connecting the members for relative movement of the forward member toward and away from the rearward member, and characterised in that

a single actuator engages each of the legs of each wall-engaging mechanism for coordinated extension of the legs to bring each wall-engaging surface into contact with the wall of the conduit.

2. The vehicle of claim 1 wherein the extensible means comprises a cylinder and rod, the cylinder being fixed to one of the forward and rearward members and the rod being fixed to the other of forward and rearward members, and wherein the actuator of the wall-engaging mechanism fixed to the cylinder includes an annular piston formed around the cylinder.
3. The vehicle of claim 1 or claim 2 wherein the actuator of the wall-engaging mechanism fixed to the rod is received within the rod.

4. The vehicle of claim 3 wherein both actuators are substantially concentric with, and mounted for movement in the direction of the longitudinal axis of the cylinder and rod connecting the forward and rearward members.
5. The vehicle of any one of the preceding claims wherein the legs are of equal length, angularly spaced equidistantly around each member and mounted to allow each actuator to accurately centre each member and consequently centre the vehicle within a tubular conduit when the legs are extended.
6. The vehicle of any one of the preceding claims wherein the legs of each wall-engaging mechanism are pivotally mounted.
7. The vehicle of any one of the preceding claims wherein at least one of the members further includes wheels for engaging the walls of the pipe to support the member.
8. The vehicle of claim 7 wherein the wheels are connected to the wall-engaging mechanism such that the wheels are retracted when the wall-engaging surfaces are extended.

9. The vehicle of claim 8 wherein at least one wheel is resiliently connected to each leg to allow the wheel to ride over irregularities in the wall of the pipe.
10. The vehicle of any one of the preceding claims wherein a foot on which the wall-engaging surface is provided is connected to or formed on each of the legs.
11. The vehicle of claim 10 wherein each foot is pivotally mounted to the leg.
12. The vehicle of claim 11 wherein each leg is pivotally attached to the foot by a first pivot and to the respective member by a second pivot; and the wall-engaging mechanism further includes a control link pivotally attached to the foot at one end by a third pivot and to the respective member at an opposite end by a fourth pivot for parallel movement of the foot.
13. The vehicle of any one of any one of claims 10-12 wherein the mounting the feet on the rearward member includes a self-servo action automatically increasing the frictional engagement between the feet and the conduit when a rearwardly directed force is applied to the rearward member when the feet are engaged.
14. The vehicle of any one of the preceding claims wherein each wall-engaging mechanism is a modular assembly demountably fixed to the extensible

means, thereby allowing the wall-engaging assemblies to be changed to accommodate different ranges of conduit sizes.

15. The vehicle of any one of the preceding claims wherein the wall-engaging mechanism is remotely controlled for extending and retracting the feet, allowing the apparatus to propel itself in a stepwise manner through the conduit in either direction.

16. Apparatus for cleaning pipes including: the vehicle of any one of the preceding claims and further including means for loosening material to clear or clean the conduit.

17. The apparatus of claim 16 wherein the loosening means for loosening material to clear or clean the conduit is a rotary cutter mounted at the front of the forward member.

18. The apparatus of claim 16 or claim 17 wherein a water spray is provided at the cutter for lubrication, cleaning and aiding removal of the loosened material.

19. The apparatus of any one of claims 16-18 further including a vacuum line for removing the loosened material.

20. The apparatus of any one of claims 16-19 wherein wheels are mounted on the front member to support the cutter centrally within the conduit while the front member is advanced.

21. The apparatus of any one of claims 16-20 further including a device for transporting material in a first direction through a conduit, the device including:

an elongate shaft adapted to be fixed to means for reciprocating the shaft in the first direction and an opposing second direction;

a plurality of paddles for impinging the material, the paddles being fixed to the shaft at longitudinally spaced positions, each paddle being adapted to close so as to occlude at least a lower section of the conduit when moved in the first direction and to open so as not to occlude at least the lower section of the conduit when moved in the second direction such that material is transferred in the first direction between adjacent paddles.

22. The apparatus of claim 21 wherein said device is actuated by reciprocation of the rearward member, or is fixed to the rearward member by a reciprocating actuator.

23. The apparatus of claim 22 wherein each paddle is fixed to the shaft by a pivot.

24. The apparatus of claim 23 wherein the paddles are at least partly circular for use in a cylindrical conduit.

25. A method of operating a vehicle as claimed in any one of claims 1 to 15 including:

alternately operating each actuator to simultaneously extend the legs of the respective wall-engaging mechanism to contact the wall of the conduit, and

operating the extensible means to move the forward and rearward members when the respective legs are in a retracted position in order to move the vehicle in a stepwise manner through the conduit.

26. A method of operating apparatus for cleaning pipes as claimed in any one of claims 16 to 24, wherein the loosening means is fixed to the forward member and the apparatus further includes a sensor for sensing the load applied to the loosening means when it is brought into contact with the material to be cleaned or cleared from the conduit, including:

actuating the wall-engaging mechanism on the rearward member to engage the wall of the conduit to hold the rearward member in a stationary position;

operating the extensible means to advance the loosening means, and

modulating the rate at which the loosening means is advanced in accordance with the load measured by the sensor.

27. Apparatus for cleaning pipes substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.